

IN THE DRAWINGS

The attached sheets of drawings include changes to Figs. 1, 6, and 7. These sheets, which include Figs. 1, 6, and 7, replace the original sheets including Figs. 1, 6, and 7.

Attachment: Replacement Sheets

REMARKS/ARGUMENTS

Favorable reconsideration of this application, as presently amended and the following remark, is respectfully requested.

Claims 1, 5-11, 13-15, and 17-22 are pending in this amendment. By this amendment, the Abstract is amended; the specification is amended; Figures 1, 6, and 7 are amended; Claims 1, 5-11, 13-15, and 17-20 are amended; Claims 2-4, 12, and 16 are canceled; and Claims 21-22 are added. Claim 1 is amended to incorporate the features of canceled Claims 2 and 3. The amendment of Claim 9 is supported by at least the paragraph beginning at page 13, line 12 of the original specification. It is respectfully submitted that no new matter is added by this amendment.

In the outstanding Office Action, Figures 6 and 7 were objected to; Claims 1, 5, 8, and 10 were rejected under 35 U.S.C. § 102(b) as anticipated by JP 2001-167900 to Ino; Claims 2 and 3 were rejected under 35 U.S.C. § 103(a) as unpatentable over Ino in view of U.S. Patent No. 5,466,991 to Berry; Claims 6, 7, and 9 were rejected under 35 U.S.C. § 103(a) as unpatentable over Ino in view of U.S. 2002/0038692 to Ishii; Claims 11, 12, 17, and 19 were rejected under 35 U.S.C. § 103(a) as unpatentable over Ino in view of U.S. Patent No. 5,234,526 to Chen; Claims 13, 14, 18, and 20 were rejected under 35 U.S.C. § 103(a) as unpatentable over Ino in view of Chen and Ishii; Claims 15 and 16 were rejected under 35 U.S.C. § 103(a) as unpatentable over Ino in view of Chen and Berry; Claims 1 and 8 were rejected on the ground of non-statutory obviousness-type double patenting over U.S. Patent No. 6,953,908 to Ishii in view of Ino; and Claim 1 was rejected on the grounds of non-statutory obviousness-type double patenting over Claim 1 of co-pending application 10/570,631 in view of Ino.

With respect to the objection to the drawings, Figures 1, 6, and 7 are amended by the present amendment. Accordingly, withdrawal of the objection to the drawings is respectfully requested.

With respect to the rejection of the claims under 35 U.S.C. § 102 and § 103, those rejections are respectfully traversed. As recited in Claim 1, the plasma processing apparatus includes a first chamber for accommodating therein the substrate; a second chamber including a dielectric top plate unit, the second chamber being disposed on an upper portion of the first chamber; and an antenna having a plurality of slots for irradiating a microwave towards an inside of the first chamber through the top plate unit, and the antenna is disposed on the second chamber. Claim 1 further recites that the top plate unit includes a dielectric flat plate portion formed to face the substrate and being in contact with the antenna, a dielectric side wall portion formed to extend from a peripheral region of the flat plate portion towards the substrate, with the side wall portion having a thickness not smaller than $\lambda_g/4$ but not greater than λ_g . λ_g is a wavelength of the microwave.

In accordance with the features of the claimed invention, the dielectric side wall portion as well as the dielectric flat plate portion are formed in the top plate unit so that a region (area) of the top plate unit facing the plasma generation region can be increased. Further, since the microwave is irradiated into the chamber from the side wall portion, the plasma density at the plasma generation region can be enhanced. In addition, since the thickness of the side wall portion is equal to or greater than $\lambda_g/4$, it is possible to supply the microwave having a greater power to the part of the plasma generation region corresponding to the outer periphery of the substrate. Meanwhile, in case where the thickness of the side wall portion is considerably thick, an interference pattern originating from a variation of a power density of the electromagnetic field is produced by the standing waves formed in the side wall portion, and thus the plasma becomes an unstable state. However, the occurrence of

the interference pattern can be suppressed and the plasma can be produced stably by the sidewall portion having a thickness smaller than λ_g .

In contrast, Ino discusses dielectric body member 2, which corresponds to the flat plate portion of Claim 1. However, Ino does not disclose, suggest nor imply that a dielectric side wall portion is formed to extend from a peripheral region of a flat plate portion towards a substrate and the side wall portion has a thickness not smaller than $\lambda_g/4$ but not greater than λ_g . Further, Ino's dielectric body member 2, which corresponds to the flat plate portion of Claim 1, is not in contact with an antenna 6. Therefore, the structure of the plasma processing apparatus as recited in Claim 1 is different from that of Ino.

Berry does not make up for the deficiencies of Ino discussed above. Specifically, Berry discusses that a thickness of a window, which corresponds to the dielectric top plate unit of Claim 1, at a periphery, is chosen to maximize transmitted microwave power, and often it is one quarter of wavelength in the window. However, Berry does not disclose a dielectric side wall portion formed to extend from a peripheral region of a flat plate portion towards a substrate and the side wall portion having a thickness not smaller than $\lambda_g/4$ but not greater than λ_g . Therefore, neither of Ino and Berry, either taken alone or in combination, discloses nor suggests the above features recited in Claim 1.

Claim 11 recites in part, a plasma processing apparatus having a first chamber for accommodating the substrate, a second chamber including a dielectric top plate unit and disposed on an upper portion of the first chamber; and an antenna having a plurality of slots for irradiating a microwave towards an inside of the first chamber through the top plate unit, the antenna being disposed on the second chamber. The top plate unit includes a dielectric flat plate portion disposed to face the substrate; and a dielectric side wall portion formed to extend from a peripheral region of the flat plate portion towards the substrate. The gap distance between the top plate and the antenna is equal to or smaller than $\lambda_g/10$.

In accordance with the features of Claim 11, the dielectric side wall portion as well as the dielectric flat plate portion are formed in the top plate unit, so that a region (area) of the top plate unit facing the plasma generation region can be increased. Further, since the microwave is irradiated into the chamber from the side wall portion, the plasma density at the plasma generation region can be enhanced. In addition, the distribution of the electromagnetic field inside the top plate can be changed by the electromagnetic field generated in the gap between the top plate and the antenna if there is a gap greater than $1/10$ of the microwave wavelength. Therefore, the change of the distribution of the electromagnetic field inside the top plate can be prevented by making the width of gap equal to or smaller than $\lambda_g/10$.

In contrast, Ino discloses a dielectric body member 2, which corresponds to the flat plate portion of Claim 1. However, Ino does not disclose, suggest nor imply a dielectric side wall portion formed to extend from a peripheral region of a dielectric body member 2 towards a substrate. In addition, Chen, does not disclose, suggest nor imply an antenna disposed on a microwave-penetrating substance 29, which corresponds to the second chamber of Claim 11. Further, neither one of Ino and Chen discloses, suggests or implies that the gap distance between the top plate and the antenna is equal to or smaller than $\lambda_g/10$.

The Office Action rejects Claims 1 and 8 on the ground of nonstatutory obviousness-type double patenting as being unpatentable over Claims 1 and 2 of U.S. Patent No. 6,953,908 to Ishii in view of Ino; and Claim 1 is rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over Claim 1 of copending Application No. 10/570,631 in view of Ino. These rejections are respectfully traversed. In particular, Claims 1 and 2 of Ishii '908 in view of Ino and Claim 1 of copending Application No. 10/570,631 in view of Ino do not disclose a dielectric side wall portion whose thickness is for example, not smaller than $\lambda_g/4$ but not greater than λ_g , with λ_g being a wavelength of the

microwave. In view of the foregoing, it is respectfully submitted that the double patenting rejections should be withdrawn.

Consequently, for the reasons discussed in detail above, no further issues are believed to be outstanding in the present application, and the present application is believed to be in condition for formal allowance. Therefore, a Notice of Allowance is earnestly solicited.

Should the Examiner deem that any further action is necessary to place this application in even better form for allowance, the Examiner is encouraged to contact the undersigned representative at the below listed telephone number.

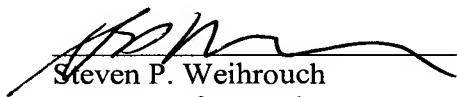
Respectfully submitted,

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